

1 This listing of claims will replace all prior versions, and listings, of claims  
2 in the application.

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4 **Listing of Claims:**

5 1. (Currently amended) A computer-readable medium having computer-executable  
6 instructions for performing steps to communicate with a remote terminal for displaying graphic  
7 user interface images, comprising:

8 receiving a drawing request to display a fragment on the remote terminal, the fragment  
9 including a plurality of glyphs;

10 determining whether the fragment has been cached in a fragment cache at the remote  
11 terminal; and

12 when it is determined that the fragment has been cached, sending a fragment index  
13 associated with the fragment to the remote terminal, the fragment index identifying an entry in  
14 the fragment cache that stores data representing the fragment.

15 2. (Original) A computer-readable medium as in claim 1, having  
16 further computer-executable instructions for performing the  
17 steps of checking whether each of the glyphs in the fragment  
18 has been cached in glyph caches at the remote computer, and,  
19 for a glyph in the fragment that has not been cached, sending  
20 graphic representation data for said glyph and a cell index to  
21 the remote terminal, the cell index identifying a cell in the  
22 glyph caches for storing the graphic representation data for  
23 said glyph.  
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1 3. (Original) A computer-readable medium as in claim 2, having  
2 further computer-executable instructions for performing the  
3 step of constructing a fragment glyph array containing a  
4 plurality of cell indices each identifying a cell in the glyph  
5 caches that stores graphic representation data for a glyph in  
6 the fragment.

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8 4. (Original) A computer-readable medium as in claim 3, having  
9 further computer-executable instructions for performing the  
10 step of generating from the fragment glyph array a fragment  
11 key for identifying the fragment to be displayed, and wherein  
12 the step of determining whether the fragment has been cached  
13 includes checking a look-up table that lists fragment indices  
14 of fragments cached in the fragment cache at the remote  
15 terminal.

16 5. (Original) A computer-readable medium as in claim 4, wherein  
17 the step of generating the fragment key includes applying a  
18 cryptographic checksum to the fragment glyph array.

19  
20 6. (Original) A computer-readable medium as in claim 5, having  
21 further computer-executable instructions for performing, when  
22 it is determined that the fragment has not been cached, the  
23 step of sending the fragment glyph array and a fragment index  
24 to the remote terminal, the fragment index identifying an  
25 entry in the fragment cache for storing the fragment glyph  
array.

1 7. (Original) A method of operating a remote terminal under the  
2 control of a terminal server connected to the remote terminal  
3 through a network, comprising the steps of:

4 receiving, by the terminal server, a request to display a  
5 fragment on the remote terminal, said fragment to be displayed  
6 including a plurality of glyphs;

7 determining by the terminal server whether each of the  
8 glyphs of the fragment to be displayed has been cached in  
9 glyph caches at the remote terminal;

10 when each of the glyphs of the fragment to be displayed  
11 is cached in the glyph caches, determining whether the  
12 fragment to be displayed has been cached in a fragment cache  
13 at the remote terminal;

14 obtaining, when the fragment to be displayed has been  
15 cached in the fragment cache, a fragment index identifying an  
16 entry in the fragment cache corresponding to the fragment to  
17 be displayed, said entry in the fragment cache containing data  
18 identifying locations in the glyph caches whether graphic  
19 representation data for the glyphs of the fragment are stored;

20 sending, by the terminal server, the fragment index to  
21 the remote terminal;

22 retrieving, by the remote terminal, said entry in the  
23 fragment cache according to the fragment index;

24 retrieving, by the remote terminal, from the glyph caches  
25 the graphic representation data for the glyphs in the fragment  
according to the data in the entry in the fragment cache; and

1 displaying, by the remote terminal, the fragment  
2 according to the graphic representation data retrieved from  
3 the glyph caches.

4 8. (Original) A method as in claim 7, further including the steps  
5 of sending, when a glyph in the fragment has not been cached,  
6 graphic representation data for said glyph and a cell index to  
7 the remote terminal, and storing, by the remote terminal, the  
8 graphic representation data in a cell of the glyph caches  
9 corresponding to the cell index sent by the terminal server.

10 9. (Original) A method as in claim 7, wherein the step of  
11 determining whether the fragment has been cached includes  
12 assigning a fragment key to the fragment for identification  
13 thereof, and checking a look-up table listing fragment keys of  
14 fragments cached in the fragment cache at the remote terminal.

15 10. (Original) A method as in claim 9, further including the step  
16 of constructing a fragment glyph array containing cell indices  
17 associated with the glyphs of the fragment, each of the cell  
18 indices in the fragment glyph array corresponding to a glyph  
19 of the fragment and identifying a cell in the glyph caches  
20 that stores graphic representation data for said glyph.

21 11. (Original) A method as in claim 10, wherein the step of  
22 determining whether the fragment has been cached includes  
23 deriving a fragment key from the fragment glyph array, and  
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1 checking whether the fragment key exists in a look-up table  
2 listing fragments cached in the fragment cache at the remote  
3 computer.

4 12. (Original) A method as in claim 11, wherein the step of deriving  
5 the fragment key includes applying a cryptographic checksum  
6 function to the fragment glyph array.

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8 13. (Original) A method as in claim 7, wherein the step of  
9 determining whether each of the glyphs of the fragment has  
10 been cached includes assigning for each glyph in the fragment  
11 a glyph key for identification thereof, and checking whether  
12 said glyph key is found in a look-up table maintained by the  
13 terminal server for identifying glyphs cached in the glyph  
14 caches at the remote terminal.

15 14. (Original) A computer-readable medium having stored thereon a  
16 data structure, comprising at least a first table having a  
17 plurality of cells each containing graphic representation data  
18 for a glyph, and a second table having a plurality of entries  
19 each containing an array of cell indices corresponding to  
20 glyphs in a text fragment, each of the cell indices  
21 identifying a cell in said at least a first table.

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23 15. (Original) A computer-readable medium as in claim 14, wherein  
24 the array of cell indices includes coordinate data  
25 representing separations between the glyphs in the fragment.

1 16. (Original) A computer-readable medium as in claim 15, wherein  
2 the coordinate data represent a space between two character  
3 glyphs.

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5 17. (New) A computer-readable medium having stored thereon a data structure,  
6 comprising at least a first table having a plurality of cells each containing graphic representation  
7 data for a glyph, and a second table having a plurality of entries each containing an array of cell  
8 indices corresponding to glyphs in a text fragment, each of the cell indices identifying a cell in  
9 said at least a first table, wherein the computer readable medium has computer-executable  
10 instructions for performing steps to communicate with a remote terminal for displaying graphic  
11 user interface images, comprising:

12 receiving a fragment index identifying an entry in the second table; and  
13 displaying the fragment associated with the received fragment index.  
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16 18. (New) A computer-readable medium as in claim 17, wherein the array of cell  
17 indices includes coordinate data representing separations between the glyphs in the fragment.

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19 19. (New) A computer-readable medium as in claim 18, wherein the coordinate data  
20 represent a space between two character glyphs.

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22 20. (New) A computer-readable medium as in claim 1, wherein the determining act  
23 comprises testing the fragment cache to verify that each glyph in the fragment is stored in the  
24 fragment cache.

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26 21. (New) A computer-readable medium as in claim 20, further comprising:  
27 storing a plurality of glyph caches on the remote terminal,  
28 wherein the fragment cache comprises a plurality of entries each having location  
29 information identifying storage locations in the glyph caches for the glyphs of the fragment.

1           22.   (New) A computer readable medium as in claim 20, having further computer-  
2   executable instructions for performing the steps of identifying a glyph in the fragment that is not  
3   currently stored in the cache, sending graphic representation data for said glyph and a cell index  
4   to the remote terminal, the cell index identifying a cell in the glyph caches for storing the graphic  
5   representation data for said glyph.

6           23.   (New) A computer-readable medium as in claim 1, wherein the fragment cache is  
7   implemented using a glyph caching scheme.

8           24.   (New) A computer-readable medium as in claim 1, having further computer-  
9   executable instructions for performing the step of maintaining a local fragment cache  
10   identification table to identify which fragments are cached on the remote terminal.

11          25.   (New) A computer-readable medium as in claim 24, wherein the local fragment  
12   cache identification table stores fragment identification values comprising information  
13   identifying one or more fragment storage locations in the fragment cache at the remote terminal.

14          26.   (New) A computer-readable medium as in claim 25, wherein the local fragment  
15   cache identification table comprises a lookup table having fragment keys associated with  
16   fragment indices identifying corresponding entries in the fragment cache at the remote terminal.

17          27.   (New) A computer-readable medium as in claim 26, wherein the fragment cache  
18   is based on a glyph cache system.

19          28.   (New) A computer-readable medium as in claim 27, having further computer-  
20   executable instructions for performing the step of maintaining a local glyph cache lookup table  
21   for the glyph caches stored at the remote terminal, wherein the glyph cache lookup table  
22   comprises glyph keys associated with cache cell indices for identifying corresponding cells in the  
23   glyph caches.

1 29. (New) A computer-readable medium as in claim 1, having further computer-  
2 executable instructions for performing the steps of:

3 when it is determined that the fragment has not been cached:

4 identifying missing glyphs of the fragment that have not been cached at the  
5 remote terminal;

6 caching the missing glyphs at the remote terminal;

7 determining a fragment index for the fragment, the fragment index identifying an  
8 entry in the fragment table for storing said fragment;

9 storing the fragment index on a local computer system for maintaining the  
10 fragment cache on the remote terminal; and

11 sending the fragment index to the remote terminal for caching the fragment in an  
12 entry of the fragment cache identified by the fragment index.

13 30. (New) A method of displaying fragments each containing a plurality of glyphs on  
14 a remote computer, comprising:

15 caching a fragment on the remote computer;

16 assigning a fragment identification value to the cached fragment;

17 receiving a request to display the fragment on the remote computer;

18 determining that the fragment has been cached on the remote computer; and

19 sending a request to the remote computer to display the cached fragment, the  
20 request including the fragment identification value.



1           31. (New) A method as in claim 30, wherein the remote computer includes a  
2 fragment cache for managing cached fragments, the fragment cache having a plurality of entries  
3 each corresponding to a cached fragment and containing information identifying locations of  
4 data for glyphs of said corresponding cached fragment.

5           32. (New) A method as in claim 31, wherein the steps of assigning, receiving,  
6 determining and sending are performed by a server computer system.

7           33. (New) A method as in claim 32, further including the step of maintaining by the  
8 server computer system a fragment cache identification table for determining which fragments  
9 have been cached on the remote computer.  
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